WHAT IS CLAIMED IS:

1. A wireless relay based network (600, 800, 900, 1000 and 1100) comprising:

a first node (602, 802, 902, 1002 and 1102);

at least one relay station (606, 806a, 806b, 906a, 906b, 1006 and 1106); and

a second node (604, 804, 904, 1004 and 1104), characterized by said first node communicates with said second node via said at least one relay station, wherein each relay station is capable of:

receiving (702) a digital communication (607a, 807a, 807a', 907a, 907a', 1007a and 1007a') from said first node;

computing (704) a plurality of reliability values for a plurality of symbols in the received digital communication; and

transmitting (706) a digital communication (607b, 807b, 807b', 907b, 907b', 1007b and 1007b') that has the computed reliability values embedded therein to said second node.

2. The wireless relay based network of Claim 1, wherein each relay station performs the computing step using a maximum a posteriori (MAP) filter (612a) that computes reliability values for code symbols based on a code structure of the received digital communication.

3. The wireless relay based network of Claim 2, wherein each MAP filter also filters the received digital communication and redistributes noise to unreliable parts in the transmitted digital communication.

4. The wireless relay based network of Claim 1, wherein each relay station performs the computing step using a soft output channel decoder (612b) that computes reliability values for information symbols based on a code structure of the received digital communication.

5. The wireless relay based network of Claim 4, wherein said soft output channel decoder employs:

a maximum a posteriori (MAP) algorithm;

a soft output Viterbi algorithm (SOVA);

a Log-MAP algorithm; or

a Max-LOG-MAP algorithm.

6. The wireless relay based network of Claim 1, wherein the computed reliability values are embedded in the transmitted digital communication such that high reliability symbols are transmitted with higher power and low reliability symbols are transmitted with lower power to said second node.

7. The wireless relay based network of Claim 1, wherein the computed reliability values are embedded in the transmitted digital communication in a manner where the reliability symbols are used to modulate an amplitude of the digital communication transmitted to said second node.

8. The wireless relay based network of Claim 1, wherein the computed reliability values are embedded in the transmitted digital communication in a manner where the reliability symbols are used to modulate a phase of the digital communication transmitted to said second node.

9. The wireless relay based network of Claim 1, wherein the computed reliability values are embedded in the transmitted digital communication in a manner where the reliability symbols are used to vary a bandwidth of the digital communication transmitted to said second node.

10. The wireless relay based network of Claim 1, wherein the computed reliability values are embedded in the transmitted digital communication in a manner where the reliability symbols are used to vary a signal time occupation of the digital communication transmitted to said second node.

11. The wireless relay based network of Claim 1, wherein the computed reliability values are embedded in the transmitted digital communication in a manner where the reliability symbols are used to vary a signal constellation size of the digital communication transmitted to said second node.

12. The wireless relay based network of Claim 1, wherein said first node is:

a base station;

a mobile station; or

a relay station.

13. The wireless relay based network of Claim 1, wherein said second node is:

a base station;

a mobile station; or

a relay station.

14. The wireless relay based network of Claim 1, wherein each relay station is:

a base station;

a mobile station; or

a stand alone relay station.

15. The wireless relay based network of Claim 1, wherein said received digital communication is:

an uplink received digital communication;

a downlink received digital communication;

a base station peer-to-peer received digital communication; or

a mobile station peer-to-peer received digital communication.

16. The wireless relay based network of Claim 1, wherein said transmitted digital communication is:

an uplink transmitted digital communication;

a downlink transmitted digital communication;

a base station peer-to-peer transmitted digital communication; or

a mobile station peer-to-peer transmitted digital communication.

17. The wireless relay based network of Claim 1, wherein when multiple relay stations each transmit the digital communication then said second node combines the transmitted digital communications.

18. The wireless relay based network of Claim 1, wherein when one relay station transmits multiple digital communications at different times then said second node combines the transmitted digital communications.

19. The wireless relay based network of Claim 1, wherein when one relay station knows a channel response of a link between that relay station and said second node then that relay station is able to construct a transmitted digital communication which is coherently combined at said second node with a similar transmitted digital communication received from another relay station.

20. A relay station (606, 806a, 806b, 906a, 906b, 1006 and 1106) capable of enabling communications between a first node (602, 802, 902, 1002 and 1102) and a second node (604, 804, 904, 1004 and 1104) by performing the following steps characterized by:

receiving (702) a coded/modulated digital communication (607a, 807a, 807a', 907a, 907a', 1007a and 1007a') from said first node;

computing (704) a plurality of reliability values for a plurality of symbols in the received coded/modulated digital communication; and

transmitting (706) a coded/modulated digital communication (607b, 807b, 807b', 907b, 907b', 1007b and 1007b') that has the computed reliability values embedded therein to said second node.

21. The relay station of Claim 20, further comprising a maximum a posteriori (MAP) filter (612a) that computes reliability values for code symbols based on a code structure of the received coded/modulated digital communication.

22. The relay station of Claim 20, further comprising a soft output channel decoder (612b) that computes reliability values for information symbols based on a code structure of the received coded/modulated digital communication.

23. The relay station of Claim 20, wherein the computed reliability values are explicitly embedded in the coded/modulated digital communication transmitted to said second node.

24. The relay station of Claim 20, wherein the computed reliability values are implicitly embedded in the coded/modulated digital communication transmitted to said second node.

25. The relay station of Claim 20, wherein said relay station is used in a wireless multi-hop network.

26. The relay station of Claim 20, wherein a link between said relay station and said first node has a smaller bandwidth than a link between said relay station and said second node.

27. The relay station of Claim 20, wherein each relay station is:

a base station;

a mobile station; or

a stand alone relay station.

28. A method (700) for enabling a relay station (606, 806a, 806b, 906a, 906b, 1006 and 1106) to provide reliable digital communications between a first node (602, 802, 902, 1002 and 1102) and a second node (604, 804, 904, 1004 and 1104), said method characterized by the following steps:

receiving (702), at said relay station, a digital communication (607a, 807a, 807a', 907a, 907a', 1007a and 1007a') from said first node;

computing (704), at said relay station, a plurality of reliability values for a plurality of symbols in the received digital communication; and

transmitting (706), at said relay station, a digital communication (607b, 807b, 807b', 907b, 907b', 1007b and 1007b') that has the computed reliability values embedded therein to said second node.

29. The method of Claim 28, wherein said computing step if performed a maximum a posteriori (MAP) filter (612a) that computes reliability values for code symbols based on a code structure of the received digital communication.

30. The method of Claim 28, wherein said computing step if performed a soft output channel decoder (612b) that computes reliability values for information symbols based on a code structure of the received digital communication.

31. The method of Claim 28, wherein the computed reliability values are explicitly embedded in the digital communication transmitted to said second node.

32. The method of Claim 28, wherein the computed reliability values are implicitly embedded in the digital communication transmitted to said second node.